Part1 - Part2 - MultiPage

JPEG image compression FAQ, part 1/2

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This article answers Frequently Asked Questions about JPEG image compression.
This is part 1, covering general questions and answers about JPEG. Part 2
gives system-specific hints and program recommendations. As always,
suggestions for improvement of this FAQ are welcome.

New since version of 14 March 1999:
  * Expanded item 10 to discuss lossless rotation and cropping of JPEGs.

This article includes the following sections:

Basic questions:

[1] What is JPEG?
[2] Why use JPEG?
[3] When should I use JPEG, and when should I stick with GIF?
[4] How well does JPEG compress images?
[5] What are good "quality" settings for JPEG?
[6] Where can I get JPEG software?
[7] How do I view JPEG images posted on Usenet?

More advanced questions:

[8] What is color quantization?
[9] What are some rules of thumb for converting GIF images to JPEG?
[10] Does loss accumulate with repeated compression/decompression?
[11] What is progressive JPEG?
[12] Can I make a transparent JPEG?
[13] Isn't there a lossless JPEG?
[14] Why all the argument about file formats?
[15] How do I recognize which file format I have, and what do I do about it?

[16] What other common compatibility problems are there?
[17] How does JPEG work?
[18] What about arithmetic coding?
[19] Could an FPU speed up JPEG? How about a DSP chip?
[20] Isn't there an M-JPEG standard for motion pictures?
[21] What if I need more than 8-bit precision?
[22] How can my program extract image dimensions from a JPEG file?

Miscellaneous:

[23] Where can I learn about using images on the World Wide Web?
[24] Where are FAQ lists archived?

This article and its companion are posted every 2 weeks. If you can't find part 2, you can get it from the news.answers archive at rtfm.mit.edu (see "[24] Where are FAQ lists archived?"). Part 2 changes very frequently; get a new copy if the one you are reading is more than a couple months old.

Subject: [1] What is JPEG?

JPEG (pronounced "jay-peg") is a standardized image compression mechanism. JPEG stands for Joint Photographic Experts Group, the original name of the committee that wrote the standard.

JPEG is designed for compressing either full-color or gray-scale images of natural, real-world scenes. It works well on photographs, naturalistic artwork, and similar material; not so well on lettering, simple cartoons, or line drawings. JPEG handles only still images, but there is a related standard called MPEG for motion pictures.

JPEG is "lossy," meaning that the decompressed image isn't quite the same as the one you started with. (There are lossless image compression algorithms, but JPEG achieves much greater compression than is possible with lossless methods.) JPEG is designed to exploit known limitations of the human eye, notably the fact that small color changes are perceived less accurately than small changes in brightness. Thus, JPEG is intended for compressing images that will be looked at by humans. If you plan to machine-analyze your images, the small errors introduced by JPEG may be a problem for you, even if they are invisible to the eye.

A useful property of JPEG is that the degree of lossiness can be varied by adjusting compression parameters. This means that the image maker can trade off file size against output image quality. You can make *extremely* small files if you don't mind poor quality; this is useful for applications such as indexing image archives. Conversely, if you aren't happy with the output quality at the default compression setting, you can jack up the quality until you are satisfied, and accept lesser compression.

Another important aspect of JPEG is that decoders can trade off decoding speed against image quality, by using fast but inaccurate approximations to the required calculations. Some viewers obtain remarkable speedups in this way. (Encoders can also trade accuracy for speed, but there's usually less reason to make such a sacrifice when writing a file.)